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The Contrasting Functions of Nutrition on Reproduction in Dairy Cows

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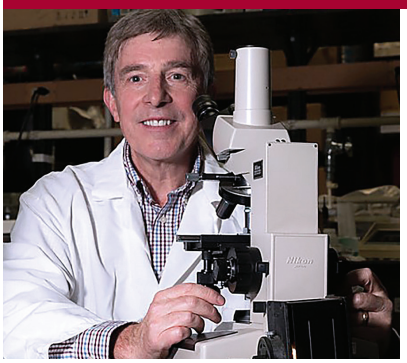
Answers to Questions Asked, Courtesy of:



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Q. With the possibility of using daughter pregnancy rate in selection over the past 20 years, what physiological changes have been observed in cows with improved fertility? Do more cows maintain BCS after calving?

A. I calculated from daughter pregnancy rate to days open, and then I took the Council on Dairy Cattle Breeding data for breeding values for daughter pregnancy rate. The days open increased from 1955 to 2000, and in 2000 they started to drop. We started selecting a little bit around that time, but we haven't changed the breeding values for daughter pregnancy rate very much. We've just flattened it out. And it's clear the trend for increased days open from 1955 to 2000 is associated with decreasing reproductive genetics. The weird thing is the decrease in days open from 2000 to today does not seem to be associated with a dramatic increase in reproductive genetics. What you can see is that with the early part of the decrease (early 2000s), there really is no change in cow conception rate. It's about 33%. Then at about 2011 the cow conception rate started coming up. It's now somewhere between 33-45%. It's really come up a lot, so I think this early drop probably did not have a lot to do with genetic selections at that time. It probably had to do with management like timed AI programs and the automatic heat detection systems. And then when the fertility is coming up, it probably had to do with the development of double ovsync, maybe some selection on it, more high fertility cycle. The changes in daughter pregnancy rates aren't being explained very well by our selections. They seem to be related more to some program changes that are happening and probably soon we'll see the effects of our intense genetic selection. It's going to be interesting to see if that's happening. One thing that's interesting is the improvements in fertility with double ovsync seem to be independent of the improvements with genetics. Julio Giardiano has a really big study where he took different groups for genetics. Either breeding to estrus or to double ovsync were improved in both of them. Double ovsync was always above the estrus breeding fertility. So, it seems what we're selecting in could be BCS, could be other things we're selecting for. It's not just the hormonal concentrations that we're improving in our double ovsync protocol. It's probably something different.

Q. If you look at the genetic potential for milk production of the cows, it has been increasing about 300 lbs per year. So, a cow of today is different from a cow from 10 years ago, a potential of 10 lbs of milk per day more. Several factors influence this. Nutrition is one of those. Management is another, and by management I mean facilities. These are interacting with each other and perhaps skewing how we can manage and feed these cows.

How can we improve this? From the hormonal point of view, you can resolve the problem. You can get cows pregnant.

A. Yes. It's the manipulative programs. With double ovsync, it's the progesterone. We pick up some of the physiology that comes because of the metabolism. As we're improving milk production, we're improving our nutritional programs also. It's probably 50-50. We know how to feed better, and the cows may be less susceptible to diseases. There are some indications on that.

Q. Any thought of how much vitamin E might be fed to a dry cow, entire dry period or close-up if two rations are fed?

A. The recommendation is somewhere in the 1000 IU/day – see NRC. If you have quite a bit of retained placenta or stillbirths, maybe supplementing with more vitamin E can be justified. There's good data behind it.

Q. The high fertility circle seems legit, the discussion in Germany is about excess calves and elongated lactation that reduces the number of calves born, what do you think about that?

A. I don't understand the excess calves. Here we have way too many calves because we're having good reproduction and using sexed semen. In the last three years, we're using dramatically more beef semen. Some herds only use sexed semen and beef semen, so they can have a better price for their cull animals.

If you have a longer lactation, if you don't get those animals pregnant quickly, it's tough to keep the BCS off of them. You don't want to lengthen out that lactation much unless you can figure out a program to keep them from gaining BCS. The best way to control BCS is to get them pregnant earlier so they're at pretty high production when they're coming into the dry period and they're going to dry off earlier.

Q. What is your advice regarding feeding lower energy diets (Goldilocks feeding) through the far dry off and close-up period to optimize insulin resistance and improve fertility in the postpartum period?

A. The herds that are doing the Goldilocks diets are doing lower energy diets. When people have problems, in a number of different countries of the world, they'll often be feeding diets too high in energy. They're feeding refusals from their lactating cows, and the cows are gaining weight during the dry period. That's really a mistake because then they start having problems. You're into the low fertility cycle, so you've got to keep the energy down in those dry-cow diets because that will allow you to minimize health problems post calving.

Q. Do you think we should trigger the use of rumen protected methionine (RPM) based on morbidity %, in the same way, well managed farms can avoid the use of RPM if they keep their cows below a fixed % of sick cows?

A. Methionine is an essential nutrient for dairy cows. Most dairies, if you look really carefully for health problems, are going to have about half the animals affected by at least one incidence of a health problem. Feeding RPM through the transition period is key. It may have a longer-term effect. It reduces the impact of diseases but not the morbidity.

Q. What is the best time (DIM) to assess BHBA and NEFA and what are acceptable levels to have balance between NEB, milk production and improving fertility?

A. The data is not overwhelming. Yes, there is some relationship with BHBA and NEFAs. I'm not sure the emphasis to put on it. BCS is a pretty good way to access it. You're not going to get an affect necessarily on milk production by lowering the BCS, but you're going to get healthier cows and improved fertility if you can keep the BCS down on those animals.

Q. Genomic selection has been available since 2009. Why wouldn't that be partly responsible for the decrease in days open?

A. It takes a few years after you start the genomic selection. The curve has definitely flattened out. If all of that decrease in days open was due to genetic selection, then that would be coming up. I think we're clearly not losing, but data is still a bit sketchy.

Q. Do you think that the optimal BCS at -21 day before calving is 2.75 and at day of calving of 3.0?

A. During the dry period, the animals should not be gaining BCS. Again, we don't have manipulative studies. It's all based on these observational studies.

Q. In Italy at the moment we receive tips to increase the voluntary waiting period (85/90 days). This, to have a better conception rate for the first AI and to have less cows with more than 30 kg of milk at the dry off. What do you think about this?

A. Well in the U.S., we're definitely going with longer voluntary waiting periods, but we're usually very, very aggressive once we get past the voluntary waiting period. You get half of them pregnant right at the end of the voluntary waiting period. We're very aggressive on shortening that interval between the breedings and the animals that did not get pregnant on that first breeding. It's not a bad strategy, but you don't want to lengthen the voluntary waiting period without having a strategy for improving your fertility and getting your animals pregnant. That will just cause problems.

Q. How can we manage feeding in transition to overcome the deficiency in energy and protein due to the inflammatory processes that take place at this time?

A. The way we're trying to do this, a change in the BCS at 21 days before calving or at calving, we're trying to do some things with the diets before dry off. After dry off, it's tough to take any condition off of them. So, you've got to still have the lactation going, and you can maybe move them into a pen where 60 days before dry off the animals with higher BCS can have a reduced energy diet. The problem is you loose milk. We're working on how you can keep the milk up but yet pull a bit of the BCS off. It's not an easy problem. The best way is to not ever have it come back on.

Q. If disease in fresh cows impacts further reproductive performance, would you "blame" the immune system somehow?

A. It could be. There's a lot of indications that the immune system could be down.

I don't know how much that immune system really is the requirement for methionine. There would be a higher requirement at least for methionine in those animals predisposed to metabolic disease. I think something is requiring more, and it could be the immune system.

Q. In regard to low energy diets, the terminology is flawed. Cows are not underfed energy. They are fed just what they need.

A. Maybe I used that terminology wrong. What we were seeing is the form of the diet. Fiber vs non-fiber carbohydrates seemed to have some impact on fertility. I don't know.

If we don't dry the cows off, don't have a dry period, they won't produce as much but won't have a negative energy balance. If you have a normal dry period, they're going to have some loss of digestive function. The ones that have more BCS are going to lose it. The ones that don't seem to maintain or even gain a little bit. They have lower health problems and more fertility.

Q. If slim cows can't lose weight, is that really a solution or will there still be negative effects on metabolism?

A. We aren't seeing big affects on production from the slimmer vs heavier. I can't tell you for sure. All of the studies that we've done are observational. The ones with lower BCS don't lose BCS, have better reproduction and usually don't have any negative affect on milk production. I don't know if there may be some other negative effects. They have less health problems, so I don't think they have big metabolic health problems. Until we do these manipulative studies where we can force the animal, not let the animal find their group, where we force them into one or another group, we're not going to know for sure if our data are confounded by the types of animals that have lower BCS.

Q. Can you repeat the impact of RPM on reproductive performance?

A. Yes. Our first study where we top dressed and were on a commercial dairy with some overcrowding and other issues, we had an effect. But in the second study in the university herds, no overcrowding, the overall effect on reproductive performance was not significant, but did show a significant positive effect on the animals with health disorders. Milk component %s were also improved typical of other research trials and field observations.

Q. If you would need to choose only one of the six paths presented today, could you be able to prioritize which one (low BCS @calving, TAI that enhance P4 (i.e., DO), supplement Vit E, supplement methionine, move to a higher fiber and lower starch or supplement PUFA)? Assuming all can be improved in a hypothetical farm with repro issue opportunities.

A. The first thing you do is put in a program that enhances progesterone. Those have shown a 15% increase in conception to first AI when you put them in a double ovsync program. That's going to help the BCS because the 50% that get pregnant right at the end of the voluntary waiting period stay in that high fertility cycle with the lower BCS. Supplemental vitamin E is only in cases where vitamin E is a problem. Methionine seems to be good, and it has effects on production and health also.

Q. How can we manage feeding in transition to overcome the deficiency in energy and protein due to inflammatory processes that take place at this time?

A. There are many ways to feed cows pre-fresh and post-fresh. Recent research has shown that in addition to managing energy intake to prevent cows from becoming over conditioned, feeding a minimum amount of metabolizable methionine (approximately 35 grams per cow for a Holstein cow) will set the cow up for a successful lactation. This is more important than the level of MP. Inflammation is increased at calving but quickly returns to normal. Metabolic problems are reduced and reproductive performance enhanced. In the latest publication, (Mateus Toledo, to be published, JDS), looking at feeding enhanced ration methionine levels (first half of lactation) on incidence of involuntary culling over a lactation showed a reduction of 6%. In tandem with the positive effects on reproduction, the time to pregnancy decreased by an average of 24 days for the cows fed the ration balanced for methionine.

TAKE HOME MESSAGES OUT OF THE Q&A: IT IS ALL ABOUT BCS MANAGEMENT

1) **The importance of managing BCS is critical to assuring better reproduction, maintaining healthy cows and optimizing milk production.**
2) **Manage BCS prior to dry-off and keep BCS stable during the dry period.**
3) **It is hard to lower BCS in late lactation without losing milk – something to work on.**
4) **Use TAI to get cows pregnant at the end of the (longer) VWP and be aggressive in culling cows that do not get pregnant.**
5) **Using RPM has a direct impact on milk production and composition, and in helping cows to overcome transition diseases. A healthier cow during transition will produce better, will get pregnant, and will maintain her pregnancy and stay in the herd longer.**
6) **Proper nutrition at all stages of the lactation cycle is important. Use of key nutrients (i.e., Vit E, RPMet) are tools at our disposal to manage BC.**

The answers to these questions are provided in good faith and are the scientific opinions uniquely of Milo Wiltbank, Professor of Animal and Dairy Sciences and Endocrinology–Reproductive Physiology, University of Wisconsin, USA

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